National Weather Service Des Moines' Newsletter

THE WEATHER WHISPER

Summer/Fall 2014

WCM—Jeff Johnson Bids Farewell

Jeff Johnson, Warning Coordination Meteorologist (WCM) at the National Weather Service (NWS), Des Moines, Iowa, will be departing Iowa in September, 2014. Mr. Johnson will become the Meteorologist in Charge at the Topeka, Kansas NWS Forecast Office.

Jeff has been at the NWS Des Moines office since 1992 and the WCM since 1994. While at the NWS Des Moines, Jeff has experienced the 1993 and 2008 major floods, numerous tornado events including the Parkersburg EF5 tornado and too many winter storms to mention.

Over the years, Mr. Johnson developed many professional relationships with emergency managers, members of the media and many others in the weather and public safety sectors. He will miss working with them and he appreciates all of the support through the years.

"I bid all of my work colleagues and partners a fond farewell and all the best in the future" Jeff said when reflecting on his upcoming departure. If you wish to contact Jeff, please do so via e-mail at jeff.johnson@noaa.gov.

NOAA Administrator Visits NWS Des Moines

by Aubry Bhattarai, Meteorologist

On Tuesday, May 13, the local National Weather Service office in Des Moines, Iowa was honored to host Dr. Kathryn Sullivan, current NOAA Administrator and Under Secretary of Commerce for Oceans and Atmosphere. Dr. Sullivan paid a brief visit to the office where she met with local NWS staff and a representative from NWS Central Region Headquarters and received briefings from the U.S. Geological Survey, Iowa Homeland Security and Emergency Management and the Safeguard Iowa Partnership about their partnerships with the NWS in Iowa. Meteorologists also used the weather event simulator to demonstrate how the NWS issues tornado and severe thunderstorm warnings, including highlighting the impact based warning experimental product. In addition, Dr. Sullivan toured the State Emergency Operations Center where she was able to see how the NWS works with other agencies and partners during high impact events in Iowa.

Back Row Left to Right: *Craig Cogil, NWS Des Moines Lead Forecaster; Jim Keeney, NWS Central Region Warning Coordination Meteorologist; Jeff Johnson, NWS Des Moines Acting Meteorologist in Charge; Brad Small, NWS Des Moines Lead Forecaster; Jeff Zogg, NWS Des Moines Senior Service Hydrologist; Kurt Kotenberg, NWS Des Moines Meteorologist Intern.*

Front Row Left to Right: *Jami Haberl, Safeguard Iowa Partnership Executive Director; Jesse Traux Safeguard Iowa Partnership Program Manager; Mindy Beerends, NWS Des Moines Journeyman Forecaster; Dr. Kathryn Sullivan, NOAA Administrator and Under Secretary of Commerce for Oceans and Atmosphere; Greg Nalley, USGS Iowa Water Science Center Associate Director; Jon Nania, USGS Iowa Water Science Center Acting Director.*

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Ken Podrazik
Aubry Bhattarai

Cover photo courtesy of Kevin Skow

Employee Spotlight—Ken Harding

Meteorologist In Charge (MIC)

I arrived on June 30, 2014, just in time for severe thunderstorms and tornadoes on my first day of work. I'm happy to say things have calmed down a bit since then. Before my return to Iowa, I was the Meteorologist in Charge in Topeka, Kansas; the Science and Operations Officer in Aberdeen, South Dakota; and a forecaster in Anchorage, Alaska. Before joining the National Weather Service, I spent almost ten years on active duty as a US Air Force Weather Officer.

I graduated from Iowa State University with B.S. in Meteorology and did my graduate school work at Colorado State University earning a M.S. in Atmospheric Science. I enjoy photography, motorcycles, and of course, weather.

Returning to my native state has been a career goal of mine for many years. I am pleased and lucky to return to a state with a great variety of weather and friendly people.

Employee Spotlight—Allan Curtis *Meteorologist Intern*

I was born and raised in Ralston, Nebraska (a suburb of Omaha), so I have been around interesting weather most of my life ranging from blizzards to tornadoes and back again. Even though I have always had an interest in weather, I entered college at the University of Nebraska-Lincoln (UNL) looking to be a Civil Engineer. After taking an introductory meteorology course, I began to mull the thought of switching my major, and finally did about half way through my sophomore year. From there, I never looked back and did my Bachelor's and Master's work in Meteorology/Climatology at UNL. While at UNL, I took a strong interest in climatology and outreach, leading me to opportunities such as interning at the High Plains Regional Climate Center and taking part in a National Science Foundation Grant that allowed me to work with K-12 teachers in the Lincoln, Nebraska area regarding meteorology and climatology topics.

Eventually though, it came time for me to leave UNL and delve into the working world. Fortunately for me, I was able to snag a job at the Midwestern Regional Climate Center within the University of Illinois-Champaign-Urbana as their Service/Assistant Climatologist. While there, I ran their service office and had a hand in numerous office activities including programming, research, education, and outreach to name a few. I thoroughly enjoyed my time in Champaign and certainly miss all of my friends and co-workers there but I could not pass up on the opportunity to jump into the National Weather Service. After a very competitive hiring process, I was fortunate enough to be offered and accept a Meteorologist Intern position here in Des Moines.

Outside of work and meteorology I am an avid sports fan, with the Nebraska Cornhuskers being my de facto team of choice (GO BIG RED!). Besides the Cornhuskers, I have a very diverse set of favorite teams, ranging from the Atlanta Braves (MLB) to the Oakland Raiders (NFL) to the Philadelphia Flyers (NHL). When not indulging in something sports related in person or on TV, I enjoy traveling and being outdoors doing activities such as biking, skiing, and golfing. Throughout all of this, my fiancé/girlfriend Allison and our Australian Shepard, Linus, have followed me from Nebraska to Illinois and now Iowa. She has been almost too understanding through the moves over the years and I surely wouldn't be where I am now without her full support. There's a reason nearly everyone says she's my better half!

That's me in a nutshell, and I definitely look forward to working with and learning from the Des Moines staff and interacting with anyone and everyone possible.

We want your feedback! We want to hear about your favorite stories and features, or if there is something you would like to see in an upcoming issue, let us know! Contact the editors at: Kenneth.Podrazik@noaa.gov or Aubry.Bhattarai@noaa.gov

2014 Cooperative Observer Length of Service Awards

by Brad Fillbach, Hydro-Meteorological Technician/Cooperative Program Manager

Dianne Hanson of Britt, Iowa receives her 20 year length of service award from Brad Fillbach—HMT, WFO DMX.

The Ankeny Wastewater Treatment Plant receives their Institutional 25 year length of service award. The award was presented by Brad Fillbach—HMT, WFO DMX. From Left: Rick Butler, Matt Buttz, Larry Metcalf.

Mark Hoover of Eldora, Iowa receives his 20 year length of service award. Award presented by Rob DeRoy, DAPM, WFO DMX.

Multiple-Radar/Multiple-Sensor Best Practice Experiment

by Rod Donavon, Senior Meteorologist

Senior meteorologist Rod Donavon participated in the Multiple-Radar/Multiple-Sensor (MRMS) severe weather products best practices experiment that took place at the National Weather Center in Norman, Oklahoma in April. Rod was one of eight meteorologists from the National Weather Service selected to participate in the experiment to help develop best practices using the new MRMS products during hazardous weather. Rod was selected due to his development of a severe hail detection technique that is used across the country. The technique can be further enhanced with the use of the MRMS data. MRMS data is comprised of data from several radar sites that sample a single point and is merged together. This is important because the MRMS data offers a better diagnosis of a thunderstorm's structure by increasing the number of vertical samples in addition to providing more rapid updates. The MRMS best practices experiment had several objectives including:

- ⇒ Determine which MRMS products are the most useful for warning decision making
- ⇒ Develop optimal procedures for hail, wind and tornado warning decision making
- ⇒ Determine how MRMS products can be integrated into traditional severe weather diagnosis
- ⇒ Calibrate MRMS products against traditional products and determine significant values that correlate with severe weather

In addition to developing best practices for severe weather diagnostics, the group tested the ability to issue more focused severe thunderstorm and tornado warnings using the maximum estimated size of hail (MESH) and derived shear rotational tracks algorithms during polygon generation. Both products provide the potential to locate the history and path of the greatest threat. An example of the rotational tracks product from central Iowa tornadic event on June 30, 2014 is shown in figure 1. The MRMS products are expected to become operational at the National Weather Service offices in 2015.

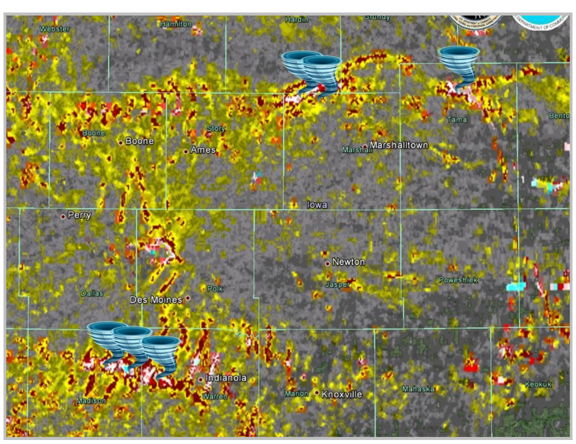

Figure 1: Rotational track example from Iowa's June 30, 2014 severe weather event. Numerous tornadoes occurred on this date. There were two main storms of interest on this date. The first storm tracked from northern Boone and Story Counties and over to northern Tama County. Three tornadoes occurred along this track including an EF2 tornado near Traer. The second storm move over northern Madison and into central Warren County. This storm also produced several tornadoes. This graphic features the rotational tracks of these storms and the locations where the tornadoes developed.

Severe Weather Digital Billboards for Polk County

by Jeff Zogg, Senior Service Hydrologist

A unique partnership will allow travelers, visitors and others who are outdoors in portions of the Des Moines metro area to receive real-time severe weather warnings and safety information via digital billboards.

On July 29, the National Weather Service (NWS) in Des Moines, the City of Des Moines, the Polk County Emergency Management Agency (EMA) and Clear Channel Outdoor announced a new partnership enabling Polk County EMA to use the 29 digital billboards owned by Clear Channel Outdoors in Polk County to communicate vital safety and disaster preparedness information during emergency situations. Polk County is home to the City of Des Moines.

Tim Jameson—President of Clear Channel Outdoor-Des Moines—demonstrates a test tornado warning on a digital billboard along Ingersoll Avenue in downtown Des Moines on July 29.

The digital billboards will display alerts for the following severe weather warnings within seconds after NWS Des Moines issues them: Tornado Warnings, Flash Flood Warnings and Severe Thunderstorm Warnings with 70+ mph winds. The warning information will automatically interrupt any other ongoing messages or advertisements. The alerts will also ask citizens to tune to a local radio station for more emergency updates and preparedness information.

These billboards are yet additional tools which can be used to alert people of hazardous weather which may impact them when minutes count. They will also help provide important, time-sensitive information to people where they are—which is a NWS priority. Clear Channel estimates that their billboards reach nearly 90 percent of adults weekly across Polk County. In addition, using these digital billboards to convey severe weather warnings—including flash flooding—is especially welcome because flash flooding is our Nation's number one severe weather-related killer—and most flash flood deaths occur when people drive into flooded roads.

A digital billboard along Ingersoll Avenue in downtown Des Moines.

Polk County EMA joins a growing number of state and local emergency agencies across the U.S.—including Boston, Florida, Maryland and the Twin Cities—which use digital billboards to communicate time-sensitive safety messages. In addition to severe weather warnings, the digital billboards can be used to provide other time-sensitive information such as missing children or other crisis situations. For example, the Massachusetts EMA used Boston-area digital billboards in a multi-staged response to the 2013 Boston Marathon bombing.

"I thank Clear Channel Outdoor for partnering . . . on this important initiative that I am sure will save lives," said Polk County EMA Director A.J. Mumm. "We want to have as many tools as possible to reach out to our residents during emergencies."

Fun Fact: An unseasonably strong heat wave settled across Iowa from September 3-7, 1939. Des Moines set its all-time September record with a high of 101°F on the 3rd and then tied the record 4 days on the 7th. Des Moines nearly tied it again on the 6th when it topped 100°F. The 101°F record stood for 74 years until the station tied it once again on September 9, 2013. Also on the 6th, Glenwood reached 107°F, tying the all-time Iowa September record which had also just been tied the previous day at Logan. Other high temperatures on the 7th included 105°F at Shenandoah, 104°F at Knoxville, and 103°F at Atlantic, Carroll, and Marshalltown. Amazingly, a month that started with such record breaking heat would end with a cold blast that sent the temperature plummeting to 16°F at Sibley on the 30th, only one degree above the all-time Iowa September record low temperature, and produced light snow and sleet at several northern Iowa locations during the last several days of the month.

Climatological Data for May through August 2014

Location	Month	Average Temp	Departure	Highest Temp	Lowest Temp	Rain	Departure
Des Moines	May	64.1°F	+1.8°F	90°F (7th)	36°F (16th)	3.40”	-1.34”
	June	73.2°F	+1.4°F	90°F (20th)	52°F (13th)	7.49”	+2.55”
	July	72.8°F	-3.5°F	93°F (21st)	53°F (3rd)	2.37”	-2.10”
	Aug	75.4°F	+1.1°F	93°F (24th)	57°F (13th)	11.36”	+7.23”
Mason City	May	58.5°F	+0.1°F	89°F (30th)	32°F (14th,17th)	2.33”	-2.35”
	June	68.9°F	+0.8°F	87°F (1st)	44°F (13th)	8.64”	+3.50”
	July	68.0°F	-3.8°F	89°F (6th)	48°F (4th,16th)	0.90”	-3.80”
	Aug	71.2°F	+1.9°F	91°F (24th)	50°F (12th)	5.07”	+1.03”
Waterloo	May	60.1°F	-0.4°F	88°F (30th,31st)	32°F (17th)	2.66”	-1.87”
	June	70.2°F	+0.2°F	88°F (1st)	45°F (13th)	9.63”	+4.65”
	July	68.9°F	-4.7°F	93°F (22nd)	46°F (3rd)	1.14”	-3.77”
	Aug	71.9°F	+0.7°F	93°F (24th)	51°F (13th)	2.49”	-1.78”
Ottumwa	May	62.9°F	+1.5°F	88°F (7th)	37°F (16th,17th)	4.20”	-0.51”
	June	71.6°F	+0.6°F	89°F (18th)	45°F (13th)	8.02”	+2.93”
	July	69.6°F	-5.4°F	90°F (22nd)	49°F (16th)	5.25”	+0.78”
	Aug	72.7°F	-0.3°F	92°F (25th)	53°F (13th)	6.86”	+2.25”

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Weather at the Movies

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CLOUDYWITHACHANCEOFMEATBALLS
DAYAFTERTOMORROW
EARTHQUAKE
EIGHTBELOW
FLOOD
GONEWITHTHEWIND
GROUNDHOGDAY
HARDRAIN
HURRICANE
ICEAGE
INTOTHESTORM
PERFECTSTORM
SHARKNADO
STORMCELL
TWISTER
VOLCANO
WEATHERMAN
WHITESQUALL
WIZARDOFOZ

Answer Key

Fall into Winter Outlook

by Miles Schumacher, Senior Meteorologist

The summer of 2014 turned out to be cooler than normal. It was certainly in stark contrast to the past two summers which were well above normal and dry. The pattern began to shift from a La Niña toward an El Niño. Though the pattern had not shifted into full El Niño through the late summer, the change did affect the atmospheric patterns, resulting in a weaker upper level ridge in the central U.S., and greater rainfall this summer.

The state of temperatures of the equatorial Pacific Ocean has warmed over the summer with much of the area slightly warmer than normal. Unlike the past two summers which exhibited a typical La Niña pattern in the atmospheric circulation, this summer begin to turn more toward normal with some change toward El Niño type conditions. This has certainly been in sharp contrast to the past two hot and dry summers. The weather patterns are likely to undergo changes as the state of temperatures in the equatorial Pacific continue to warm even though the warming remains weak. The circled area in figure 1 shows the overall warmer than normal temperatures along the equatorial Pacific. The warming is likely to continue through the fall and into the summer and into early 2015 when the peak is expected.

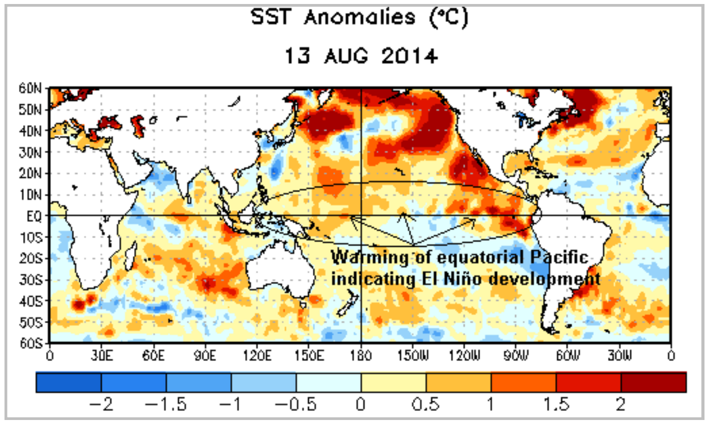

Figure 1: Sea surface temperature departure from normal, equatorial Pacific.

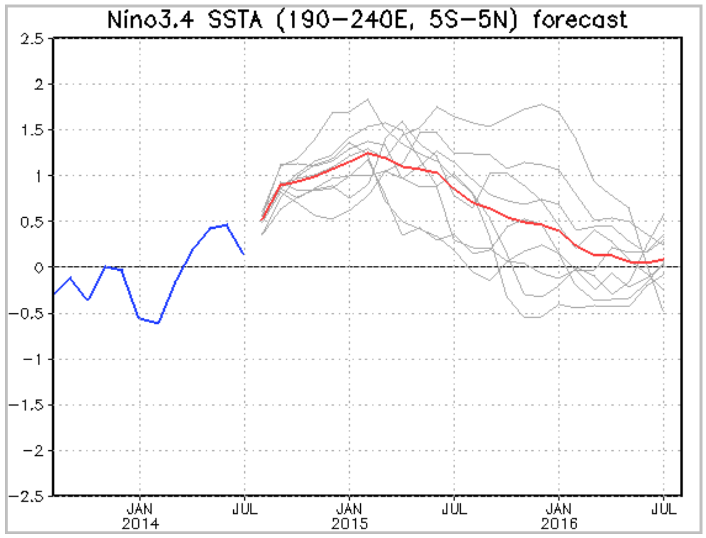

Figure 2: Sea surface temperature departure for the past eight months plotted in blue. The forecasts for the next two years follow. The red line indicates the mean of the nine forecasts made through July of 2016. The gray lines are the individual model runs. Departure in degrees C is shown on the ordinate, with time on the abscissa.

The atmosphere typically follows a three to seven year cycle between El Niño and La Niña. Depending on the phase of the Pacific Decadal Oscillation (PDO), El Niño/ La Niña is favored during warm/cold phase of the PDO. The Pacific is currently in the cold phase of PDO. La Niña conditions are favored by a two to one margin during the cold phase. The reason for that change is that during the warm phase of PDO, El Niño typically lasts 10 to 12 months. In contrast, during the warm phase of PDO, it will persist for 20 to 22 months. Although the PDO has trended positive in recent months, the overall trend is for negative PDO conditions. This is likely to interfere with the development of El Niño. Many of the models worldwide suggest the development of El Niño this fall and into the upcoming Boreal winter. Below is a set of forecasts of equatorial Pacific temperature departures from the Japan Agency for Marine-Earth Science and Equatorial Technology (JAMSTEC), see figure 2. Note the recent cooling shown by the blue line from the left. This is expected to reverse, but does signify the El Niño may not be very robust. Also note the cooling after January of 2015, out one year, leading to near normal conditions by next winter and continuing in to mid-2016. The cooling is expected during the cold phase of PDO, as was the case during the last cold phase of the PDO, roughly from1947-1977. Model forecasts suggest the SST pattern across the equatorial Pacific is likely to begin warming again this fall and peak during the winter of 2014-15, then return to near neutral by next fall. For SST departures to be considered either an El Niño or La Niño, the average temperature departure must be at least 0.5°C above or below normal, respectively, or more for three consecutive 90 day seasons.

Although in meteorology no two years are the same strictly speaking, one can look at weather patterns of the recent past to give some indications of near term weather trends in the future. This forecast is based in large part on the best fit from several of the years that were the most similar to a blend of this summer season as well as El Niño trends thus far. El Niño conditions are expected, thus considerations were also made for the state of the Pacific and the expected change to an El Niño state.

The Pacific SST's are yielding a signal for the upcoming fall and winter seasons. There are several factors to

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Fall/Winter Outlook

(Continued from page 6)

consider in addition to the statistical factors. The extent of the western U.S. drought is one such consideration as that favors warmer and drier conditions across the western U.S. The cold temperatures of the Great Lakes remain, which will also continue to have an affect on the weather pattern from Iowa on northeast. The signal from the drought does support the signal from El Niño, which would result in upper air ridging over the Rockies.

As a strengthening of El Niño is expected, there is a greater likelihood for the fall to be fairly close to normal. Enhanced precipitation to the west of Iowa, there is a higher probability that cooler weather will prevail to the west and southwest of the state. Two factors that could result in a more widespread cool region are the cooler than normal Great Lakes temperatures resulting in keeping cool high pressure to the northeast of Iowa, and how rapidly snow cover increases across the Arctic. Northeast Iowa is expected to average slightly above normal in temperature this fall, while the southwest is expected to be a little cooler and wetter than normal. It is expected that drier than normal conditions will occur across the southeast corner of the state. See figure 3.

There are indications (not shown here) that temperatures will turn warmer than normal during one of the fall months, with November being the most likely month.

Looking ahead toward the winter, it is common in years with El Niño present for the temperatures during the winter season to average warmer than normal across the northern U.S. This is not always the case, as was seen in the winter of 2009-10. The position of the warm pool in the Pacific is a major contributor to what the temperature pattern will be. If the warmest water, relatively speaking, is in the central Pacific, much of the U.S. tends to be cooler than normal, whereas if it is in the east Pacific it tends to be warmer than normal across much of the northern and western parts of the country. Years that have had a weaker El Niño, as is expected this year, generally are not as warm as would typically be expected with a stronger event. Warming is expected to reach northwest Iowa and areas west. Typically during El Niño winters the southeast U.S. is cooler than normal. With weak conditions, the cool area over the southeast U.S. is more likely to expand into southeast Iowa. Rainfall during the winter months during an El Niño winter is often less than normal across the central U.S. The best chance for below normal precipitation is over the southeast third of Iowa. See figure 4 for details.

It will be important to monitor the oceanic and atmospheric patterns over the next several months. Although the signs point more toward a pattern typical of El Niño, failure of El Niño to materialize would have a significant effect on expected winter temperatures

These outlooks are based more heavily on statistics than many of the methods used by the Climate Prediction Center. The complete set of official forecasts from the Climate Prediction Center can be found on our website.

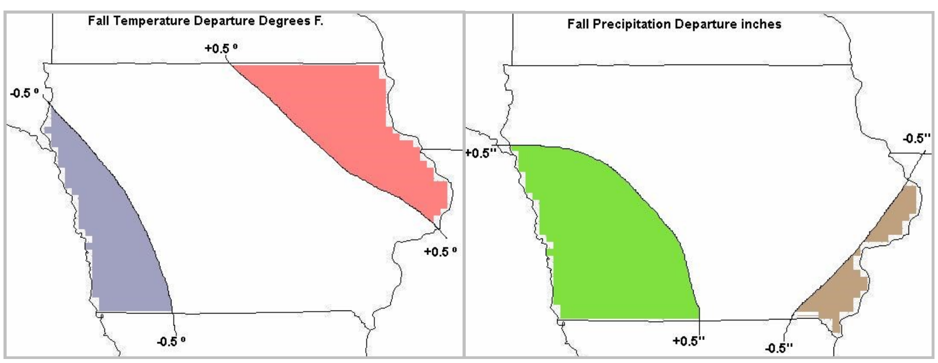


Figure 3: Mean temperature (left) and precipitation (right) departure for September of 2014 through November of 2014.

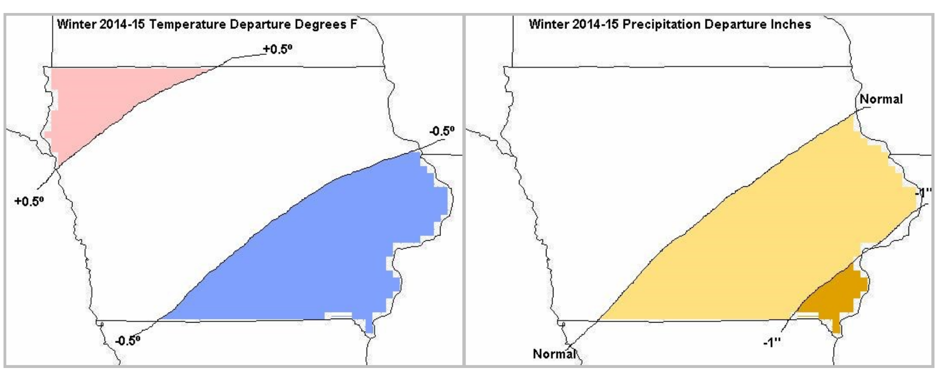


Figure 4: Mean temperature (left) and precipitation (right) departure forecast for the winter of 2014-15.

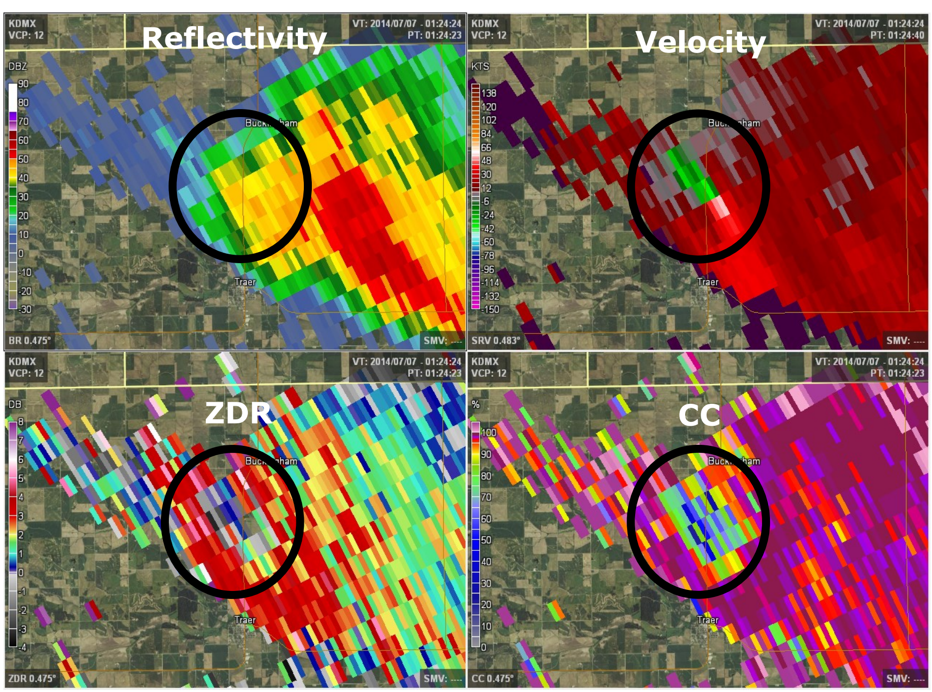
Tornadic Debris Signatures in Iowa

by Kevin Skow, Meteorologist Intern

Between 2011 and 2013, the National Weather Service WSR-88D Doppler radar network underwent a major upgrade to dual-polarization (dual-pol). Now, instead of sending out just one radio wave oriented in the horizontal, the radar simultaneously sends out a horizontal and vertically polarized wave. This enables the radar to take a cross-section of whatever particles it samples and assists meteorologists in determining their size, shape, and concentration. It also helps delineate which scatterers are meteorological (rain, hail, snow, etc.) or biological (birds, dust, and insects).

The dual-pol upgrade introduced three new products on top of the legacy reflectivity, velocity, and spectrum width data. The first, differential reflectivity (ZDR), simply calculates the difference between the horizontal and vertical channel reflectivity values. Positive numbers indicate objects oriented in the horizontal, negative values denote vertically oriented objects, and values near 0 signify spherical objects. The radar samples millions of particles multiple times within a single range bin, and correlation coefficient (CC) measures the similarity of these objects to one another. A value of 1 indicates uniformly shaped particles, while the closer one gets to 0, the more random the shape and size of the scatterers. Usually anything below 0.8 is non-meteorological in nature (the exception being large hail). Finally, differential phase shift (KDP) calculates the attenuation difference between the horizontal and vertical channels. Since rain drops become flattened as they fall and thus will attenuate the horizontal channel more than the corresponding vertical channel, KDP does an excellent job of locating regions of heavy rainfall.

One special phenomenon that has been observed on dual-pol radars with some tornadoes is the tornadic debris signature, or TDS. As the name implies, the radar is actually sampling the debris being lofted thousands of feet into the air by a tornado. Debris identification was possible before the implementation of dual-pol, but involved correlating a small but intense area of higher reflectivity values with a tight velocity couplet. Known then as a "debris ball", it was difficult to determine in real-time and sampled on only a select few tornadoes. Now, the CC and ZDR products make locating a debris signature much easier. Debris will present a very low CC signal owing to their plethora of shapes and sizes. The tumbling nature of the debris will also result in a near 0 ZDR value since the objects "appear" circular to the radar beam. The colocation of the high reflectivity values, a tight velocity couplet, and low CC/ZDR values together form the text-book TDS. The stronger and closer a tornado is to a radar site, the more likely it is that the radar will display a TDS.



A prominent TDS (black circle) with a tornado north of Traer on July 6, 2014

The Des Moines WSR-88D radar was modernized with dual-pol capabilities in September 2012. A review of radar data for the 49 tornadoes that have been recorded in the NWS Des Moines service area (central third of Iowa) in the last two years turned up six definitive TDSs and four likely candidates whose radar characteristics did not quite fit the traditional TDS model and are still being investigated. Thus, TDSs were only found for 12% of the total number of tornadoes sampled by the radar (20% if the probable TDSs are included). All but one of these signatures were noted during the 2014 tornado season, which was significantly more active than 2013. Each TDS, like the tornadoes that produced them, was unique in its size, shape, and duration. However, many of the signatures behaved like a plume, originating from the tornado and spreading out over time.

There was little correlation between the strength/duration of the tornado and whether it produced a TDS. The Lake Panorama tornadoes of May 11, 2014 and the Zearing to Union tornado of June 30 were long-tracked tornadoes relatively close to the radar that caused substantial damage, yet failed to produce a TDS. Meanwhile, brief and weak tornadoes that hit didn't strike any major objects produced TDSs. Four TDSs alone were sampled with just one storm system on June 30, 2014 in Adair, Madison, and Warren counties. The strongest and most persistent TDS was sampled on July 6, 2014 with a strong EF1 tornado over northern Tama County near Traer.

New Radar Tools for the Des Moines Weather Radar

by Roger Vachalek, Senior Meteorologist

It has been an exciting year in the National Weather Service with some new advances in radar operations technology. Some additional tools are now in use by the National Weather Service staff at the Des Moines Weather Office. A recent upgrade to the WSR-88D Doppler Radar included Dual Polarization and now AVSET and SAILS have been added to the list of available tools to the analysis toolkit of the storm interrogation meteorologist.

AVSET is a short-hand for Automated Volume Scan Evaluation and Termination. This feature can be turned on or off during the normal operation of radar and is particularly useful for lessening the time of one complete radar volume scan. First, let's back up a minute and review some terms! One complete volume scan is the pattern of vertical scanning the radar makes from near the ground to the top of its elevating cycle. The example below is for Volume Coverage Pattern 12 (VCP 12):

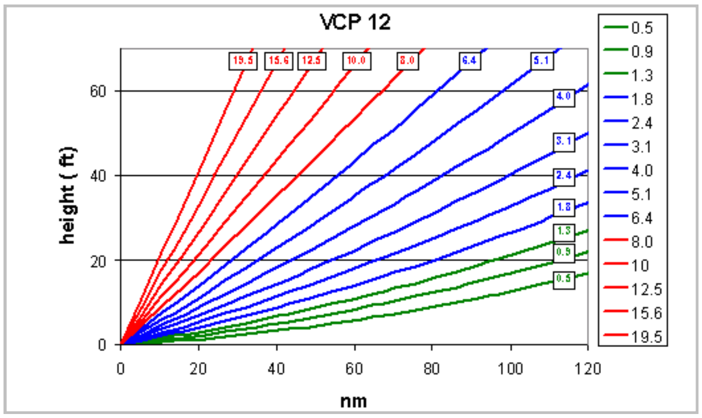


Figure 1: Radar Volume Coverage Pattern Configuration for VCP 12

In this example the radar begins to scan at 0.5 degree above the horizon and continues scanning through elevating angles up to 19.5 degrees to complete one volume scan. This process takes about 4 minutes and 30 seconds to complete. So, in our standard operations of the WSR-88D radar system, a storm interrogation meteorologist would expect to see new data arriving every 4 minutes, 30 seconds, regardless of how far away or close a storm is located to the radar. With AVSET, the data arrives faster! AVSET can be best explained by looking at the diagram in Figure 2, which shows how AVSET would work for VCP 212 with a storm far from the radar.

With AVSET running, the radar scans until it no longer detects much return from the target of interest – in this case, a thunderstorm located about 100 nautical miles from the radar site. The radar would scan from 0.5 degrees up to an elevation of 5.3 degrees and then would stop moving upward and not complete any other elevation slices from 6.4 degrees to 19.5 degrees because the radar no longer detects much of a measurable radar return signal. At this point, the

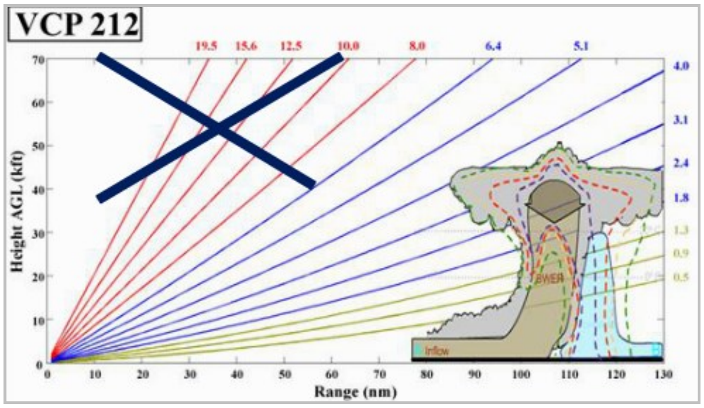


Figure 2: Radar Volume Coverage Pattern Configuration in VCP 212 with AVSET running.

radar is complete with the *present* volume scan and then moves onto the next volume scan by beginning near the ground level of 0.5 degrees above the horizon and starting all over again.

The advantage is pretty significant since we are able to cut the time of one complete volume scan from 4 minutes and 30 seconds to as little as 3 minutes and 30 seconds – a sizable savings in time! With the standard operations of having AVSET turned off, the storm interrogation meteorologist might see up to 13 scans per hour using a VCP 212 radar configuration. With AVSET on, it is possible to see up to 17 scans per hour. Now this might not seem like that great an improvement over standard operations, but any additional scans that we NWS meteorologists can view during a rapidly changing severe storm environment means that we have a much greater ability to complete our mission of *"Protecting Life and Property."* This has been a welcomed change in the Des Moines NWS Weather Office that enhances not only storm interrogation, but can also result in greater lead times when issuing severe weather warnings which in turn gives you additional time to prepare for dangerous weather events such as damaging thunderstorm winds, large hail, and tornadoes.

AVSET is just one great recent addition to our radar toolkit…*but wait…there's more!* There is another new method of storm interrogation introduced this year called SAILS. SAILS stands for *Supplemental Adaptive Intra-Volume Low-Level Scans (SAILS).* Now you know why it goes by the short-hand term *SAILS*! So – what does SAILS do for the radar's operation and how does it benefit the storm interrogation meteorologist? First, let's take a look at how SAILS works. In normal radar operations, the radar scans from near the horizon at 0.5 degrees up to a specified height using elevation cuts to complete one volume scan. This is the same process shown above in Figure 1. With SAILS active, the radar would do the following as illustrated by the diagrams in Figure 3.

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Radar Tools

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As shown in Figure 3, when SAILS is operating, an additional low-level volume cut is added to the list of available products for use by the storm interrogation meteorologist. This benefits the staff at our office because many of the important features that lead to a severe thunderstorm or tornado warning often show up in the lowest volume cut at 0.5 degrees. This would be true of a rapidly rotating meso-cyclone that may be lowering in the process of producing a tornado or perhaps more examination of strong to intense base velocities (strong thunderstorm winds) that are lowering toward the ground in a wind producing storm, such as a derecho. Again, with the addition of another slice at 0.5 degrees during each complete volume scan, there are many more available 0.5 degree slices available to the storm

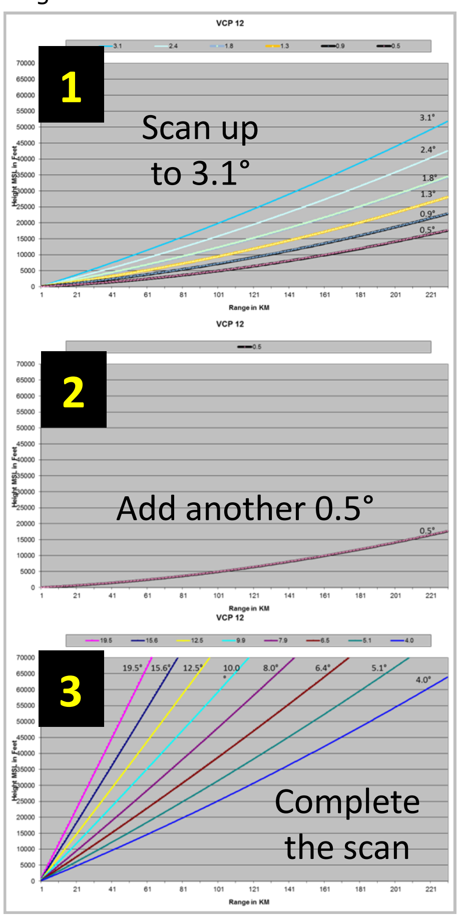

Figure 3: SAILS in action:
1) Radar scans up to 3.1°
2) Radar lowers to 0.5° and completes another volume cut
3) Radar resumes scan at 4.0° and completes the remainder of the volume scan.

interrogation meteorologist per hour. *But hold on, you say! Wouldn't it take longer* to finish one complete volume scan if we add another 0.5 degree slice in the middle of each volume scan? The answer is *"yes", it does reduce the total number of complete volume scans per hour, but the trade-off is well worth this slight disadvantage in most severe weather applications.* Even though with SAILS active, the number of complete volume scans is decreased by two in VCP 212 compared to the standard operation with SAILS off – we gain 9 additional 0.5 degree slices per hour! The benefits of both reducing the time between low-level slice updates and the nearly doubling of 0.5 degree slices per hour allows for more low-level observations of intense thunderstorms during severe weather events. This gives our staff an opportunity to better monitor the trends of the lower portion of the thunderstorm and decide how quickly the storm might be strengthening or weakening. This has major implications for warning operations and should subsequently result in more lead time for warnings and more time for you to take shelter for severe weather.

Wouldn't it be nice to run AVSET and SAILS together? Yes! In fact we can *and do run them together*. In some cases the net advantage is even better than SAILS alone or AVSET alone. The whole can definitely be greater than the sum of the parts. Take a look at the following table for comparison of the original standard operating mode compared to AVSET and SAILS, and then to SAILS and AVSET operating together:

Figure 4 (page 10) shows that for VCP 212 either AVSET or SAILS working alone provide higher numbers of 0.5 degree slices per hour – AVSET (13-17) and SAILS (22) compared to the Standard Operation (13). Figure 4 also shows the slight disadvantage of complete volume scans for SAILS (11) compared to the Standard Operation (13) and AVSET (11-13) per hour. However, with SAILS and AVSET both operating – the number of 0.5 degree slices per hour increases even more - SAILS and AVSET together (22-28) compared to AVSET alone (13-17) compared to SAILS alone (22). Looking back at the last column of Volumetric Product Updates per Hour shows that the combination of SAILS and AVSET both running together brings the total number of complete volume scans per hour back to 11 to 14 – *nearly equal or slightly exceeding the Standard Operation of 13 per hour!* It might seem a bit odd to see a range of 0.5 degree slices and a range of complete volumetric product updates per hour when AVSET is being used. However, this is completely normal because the early termination of one complete volume scan depends both on the height of the storm being viewed and the distance the storm is from the radar. If the storm is captured in only three or four elevation cuts due to being not as tall or far away from the radar, then AVSET will terminate the current complete volume scan earlier and more completed volumetric product updates per hour will be available to the radar meteorologist. This same process carries over to the case when both AVSET and SAILS are working together. One more fact about SAILS is that it is only used when the radar is in severe storm interrogation mode – that is, when the radar is in Volume Coverage Patterns VCP 12 or VCP 212. These are the coverage patterns used when significant severe weather – that which a warning might be issued – is anticipated or already occurring.

The additional number of low level elevation slices at 0.5 degrees can be critical to more lead time and earlier warnings. By issuing warnings faster with more confidence due to all of the additional weather data observed in those low level 0.5 degree slices, this will ultimately provide better warning services to you and enhance our ability to protect life and property!

VCP 12	Number of 0.5° Product Updates per Hour	Volumetric Product Updates per Hour
Standard Operation	14	14
AVSET	14 - 19	14 - 19
SAILS	24	12
SAILS and AVSET	24 - 32	12 - 16

VCP 212	Number of 0.5° Product Updates per Hour	Volumetric Product Updates per Hour
Standard Operation	13	13
AVSET	13 - 17	13 - 17
SAILS	22	11
SAILS and AVSET	22 - 28	11 - 14

Figure 4: Comparison of Standard Operating mode, AVSET, SAILS and the combination of SAILS and AVSET together.

Fire Weather: Spring Wrap-up and Upcoming Fall Season

by Frank Boksa, Meteorologist

The fire weather season got off to a bit of a late start this past spring as Iowa went into a wet pattern for the spring and early summer. Temperatures during this period were not especially hot but native grasses did quickly green up during mid April and into May. The spring and summer months were not conducive to reaching Red Flag Warning criteria given the amount of rainfall and the lack of hot temperatures. As a result, the National Weather Service Forecast Office in Johnston only issued one Fire Weather Watch through the green up season.

As we go through the fall fire weather season, which began September 1st…we have resumed issuing fire weather forecasts twice daily through the end of the fall fire weather season. This is in an effort to help those with burn needs prepare for them with the most up to date forecasts. Once the crop dry down begins to peak and warm season grasses dry, we will also debut a video on our web page this fall. The video will highlight the dangers of harvesting in dry conditions what to do to stay safe and where to get important information on whether conditions exist for fires to ignite quickly. We have also created a safety video for the spring season which will be shown early in the spring season. The purpose of these videos is to make people aware of the different dangers that each of the seasons bring with it.

At the end of this fire weather season we will meet with our customers and all the NWS offices that serve Iowa to discuss how the season went and to discuss potential improvements to the fire weather program for Iowa. If you must burn please remember to check the National Weather Service's web page and specifically the fire weather page to get the latest forecast information to burn safely.

Where Does River Level and Streamflow Data Originate?

by Jeff Zogg, Senior Hydrologist

Introduction

Floods are among our Nation's most frequent and costly natural disasters. The average annual inflation-adjusted flood losses for 2001 through 2010 were $10.2 billion. Iowa ranks #2 in the U.S. for long-term flood-related losses. In addition, over three-fourths of all Presidential disaster declarations involving Iowa have been either fully or partially due to flooding.

Given the prevalence of flooding in Iowa, the National Weather Service places a high priority on timely and accurate flood warnings and forecasts in our state. These warnings and forecasts can help people take measures to mitigate flood-related losses. In order to provide the best possible river flood warnings and forecasts, however, the NWS must know what rivers are doing in real-time before confident warnings or forecasts can be provided.

In Iowa, the NWS relies on several partners to measure river levels and streamflows and provide that data in real-time. From a statewide perspective, the largest NWS streamgaging partners are the U.S. Geological Survey, the U.S. Army Corps of Engineers and the Iowa Flood Center (IFC). Other partners include several local communities. This article will focus on the IFC. Previous Weather Whisper articles showcased the U.S. Geological Survey and the U.S. Army Corps of Engineers.

Iowa Flood Center

The IFC had its origin during Iowa's historic June 2008 floods. Among the most notable impacts of the June 2008 floods was the devastation in Cedar Rapids due to record flooding along the Cedar River. The floods caused additional significant damage elsewhere, though, including the University of Iowa where the Iowa River also reached record levels.

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River Level and Streamflow Data

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In between filling sandbags and moving out of flood-endangered buildings, University of Iowa researchers began collecting information on many aspects of the flood. The flood catalyzed the formation of new University research teams which worked together on flood-related initiatives. This work led to the realization that there was no central place in Iowa—or in our Nation—for flood-related advanced research and education. In spring 2009, the State of Iowa passed a law that established the IFC. The IFC leveraged the resources of IIHR—Hydroscience and Engineering, one of the preeminent hydraulics laboratories in the U.S. Since its inception, the IFC has become actively engaged in several flood-related projects. Among the projects is the design of a statewide network of stream sensors.

An IFC stream sensor along Willow Creek at Iowa Highway 1 in Iowa City. Credit: Iowa Flood Center.

IFC and Streamgaging

Iowa's severe flooding in 2008 demonstrated the need for more extensive monitoring of the state's rivers and streams in real-time. The IFC developed and now maintains a statewide network of stream sensors which measure stream height. The sensors were developed as a student project to design a low-cost method to measure stream levels. The sensors are solar powered and attach to the side of bridges. A sonar signal is used to measure the distance from the water surface to the sensor. The sensors transmit the stream level data via cell modem to the Iowa Flood Information System (IFIS) where the information is publicly available. The IFC also shares its stream sensor data in real-time with the National Weather Service.

The IFC maintains a network of over 200 stream sensors across the state. Another 50 stream sensors will be deployed by the end of this year. Support for sensor deployment has come from the Iowa Department of Natural Resources, the Iowa Department of Transportation, and research projects at the University of Iowa and Iowa State University.

IFC-NWS Partnership

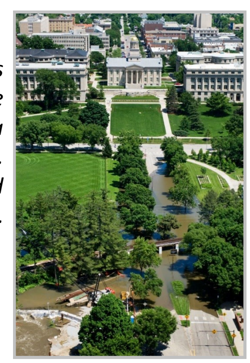
The IFC is a valuable partner of the NWS. Both entities share the goal of increased public preparedness regarding floods through outreach and education. In addition, both agencies engage in flood-related research to better understand floods and how to predict them. The NWS and IFC have also collaborated on projects such as AHPS flood inundation maps for the Mason City, Waterloo and Cedar Falls areas.

The IFC stream sensors provide valuable real-time information to the NWS during flood events. Recall from earlier Weather Whisper articles that accurate stream stage and discharge data are crucial for the NWS to accurately forecast stream levels. Presently the IFC stream sensors do not provide the important stream discharge data. Such data is provided by streamgages operated by the U.S. Geological Survey (USGS) and the U.S. Army Corps of Engineers (USACE). Although the IFC stream sensors do not provide discharge data, the NWS uses IFC stream sensor stage data to determine stream level tendencies upstream and downstream of USGS and USACE streamgages. This information helps the NWS make better-informed adjustments to its stream forecasts, thus facilitating more accurate flood warnings and forecasts.

The Future

The NWS-IFC partnership is expected to continue well into the future. The demand for NWS flood-related services is expected to continue growing due to increases in population and urbanization. Changes in precipitation activity may also result in increased flood risk. Real-time, ground-based river measurements—such as those provided by IFC stream sensors—will continue to be needed to facilitate accurate flood warnings and forecasts. In addition, ongoing and planned IFC research projects are expected to help the NWS improve its flood predictions and enhance public flood preparedness. Such IFC projects include the Iowa statewide floodplain mapping project, opportunities for improved rainfall forecasts as well as improvements in long-range probabilistic river forecast accuracy. The NWS is looking forward to its continued partnership with the IFC.

Thank you to the staff at the Iowa Flood Center for their contributions to this article.



Floodwaters encroach on the University of Iowa campus in 2008. Credit: Iowa Flood Center.

Iowa Flood Center stream sensor. Credit: Iowa Flood Center

Resources

- Iowa Flood Center. http://iowafloodcenter.org/
- Iowa Flood Information System (IFIS). http://ifis.iowafloodcenter.org/ifis/en/
- Iowa Flood Center projects. http://iowafloodcenter.org/ifc-projects/
- IIHR—Hydroscience and Engineering. http://www.iihr.uiowa.edu/

NWS Des Moines Test Bed for Blog

By Kenny Podrazik, Meteorologist

At the beginning of the summer, the National Weather Service office in Des Moines became one of four NWS offices to host a blog. The purpose of these four test bed sites is to assess the potential of operational blogging within the National Weather Service. The other test bed sites include the NWS offices from Jacksonville, Florida, Boise, Idaho, and Pendleton, Oregon. If the test beds are deemed successful, future implementation of other local NWS offices will have blogging capabilities. One thing to note, the blog is not intended to replace any other social media site or dissemination capabilities, only complement what the NWS already has in place. The prototype blogs are not supported 24x7 and may become unavailable without forewarning. That being said, there is tremendous potential for having a blog for local offices.

So far, we have explored topics such as weather event summaries, forecast discussion supplements, monthly climate reviews, preparedness, and a various other topics. Feel free to check out our NWS Des Moines blog or the other three test bed sites. Any feedback or suggestions on topics are encouraged and welcomed.

http://nws.weather.gov/blog/nwsdesmoines/
http://nws.weather.gov/blog/nwsboise/
http://nws.weather.gov/blog/nwspendleton/
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